fluctuation in physico-chemical properties due to susceptibility of shallow waters to effects of surface runoff and meteorological conditions along the Lake Michigan shore. The harsh environment of the flooded beach zone is very unstable and unsupportive of extensive or fully developed complex aquatic communities that could develop in less turbulent off-shore waters.

2) The sessile (benthos, attached periphyton) communities associated with substrates in the flooded beach zone were sparse. Excessive turbulence at the sediment surface effectively limited the establishment and development of a resident benthic community. The limiting effect of the physical disruption was more apparent within the effluent dispersion zone but low richness and diversity values were exhibited at all study stations. Although members of the Oligochaeta, Amphipoda, Diptera and Mollusca were represented, no benthic invertebrates were observed in some replicates from S120 and S340, and only a total of 7 different benthic invertebrate taxa were identified from all samples. The benthic periphyton community was effectively absent because of a lack of a stable substrate. Analysis of the natural algal periphyton collected from the shifting sand substrates (epipsammon) indicated that benthic algae were present but sparse and likely not to be established on the sandy substrates. However, tangles of loose fragmented algae characteristic of splash zone and shore periphyton were present in some epipsammon samples. Upon evaluation, these tangles were not attached to sand grains, but appeared to be deposited as flotsam on the shifting substrates most likely following wave action at the shoreline.

3) Aquatic communities associated with the water column (the plankton) exhibited a higher degree of community development than benthic communities. The greater development observed in the phytoplankton community again indicates the key role physical disruption and turbulence plays in limiting the benthic community. The phytoplankton represented members of all the major algal groups and typically exhibited the highest richness and diversity of all aquatic communities. A total of 60 different diatom taxa and 13 different non-diatom algal taxa were observed from the phytoplankton collections.

## 4.0 CONCLUSIONS

Analyses of the biological samples included taxonomic identification and enumeration of the benthos, phytoplankton, zooplankton and periphyton communities sampled at each sample site. Algal bioassays were conducted using cultured *Selenastrum capricornutum* and *Scenedesmus quadricauda* to replicate phytoplanktonic organisms exposed to different dilutions of effluent discharge characteristic of the effluent dispersion zone. Descriptive community structure metrics for each community type were used to assess potential differences between biological communities collected from sites located inside the effluent dispersion zone and biological communities collected outside the limits of the dispersion zone. Analysis of Variance (ANOVA) statistical procedures were used to detect significant differences in community structure at the 95 percent confidence level.

Analysis of the biological samples and statistical results showed few differences were present between biological communities within the effluent dispersion zone and biological communities located outside of the dispersion zone. Important findings are presented below.

1) Visual observations, including the use of SCUBA diving during sample collection indicated extensive disruption and unstable physico-chemical ecological conditions. These are a result of the natural physical setting of the extreme southern end of Lake Michigan. Low richness and diversity values observed in the biological collections from an intermittent and disruptive habitat would therefore be expected. Sample sites were selected that represented an area within the effluent dispersion zone (sites S120 and S340) and sites representing the local Lake Michigan water outside the effluent dispersion zone (sites S650, S1000, S2000 and S3500). Amoco Cove sites that represented ambient Lake Michigan conditions outside the dispersion zone were based upon previous dispersion modelling results for Outfall 001 and Outfall 002, on-site dye study interpretations, and *in situ* temperature and conductivity measurements at the time of site selection. The geographical area covered by the sample sites is best described as a flooded beach zone (USFWS 1970). The Flooded Beach zone is characterized by a nearly constant

# ATTACHMENT 5

# AMOCO FIELD BIOASSESSMENT DATA SUMMARY

*Prepared for*

AMOCO OIL COMPANY
WHITING REFINERY

*Prepared by*

ADVANCEDAQUATICTECHNOLOGY ASSOCIATES, INC.
FORT COLLINS, COLORADO

AUGUST 1994

# TABLE OF CONTENTS

## TABLE OF CONTENTS



## LIST OF TABLES



## LIST OF FIGURES

# 1.0 INTRODUCTION

## 1.1 Study Objective

The Amoco field bioassessment study was designed to determine if there are differences in community structure or function of aquatic communities between receiving water areas inside and outside the existing effluent dispersion zone. The biological data were collected to answer the question, "Considering the normal aquatic communities in Lake Michigan, are there any significant site-specific differences in these communities associated with Amoco's discharge?" The dynamic nature of Lake Michigan in the near-shore environment (physically, chemically, and biologically dependent) makes this question a challenge to answer.

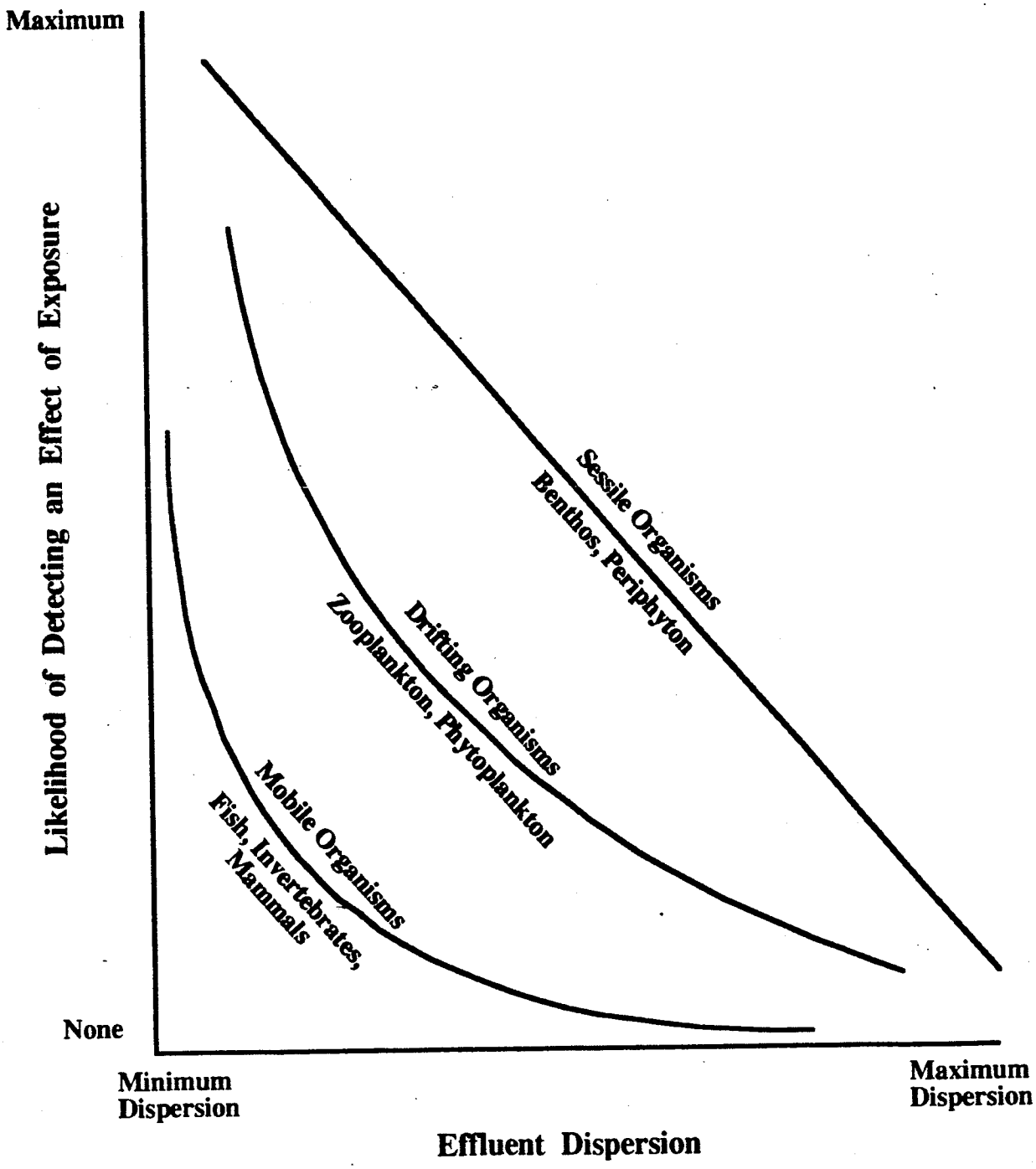
To most directly evaluate the aquatic communities, field sampling stations were divided into two categories, "inside the effluent dispersion zone" and "outside the effluent dispersion zone." These categories were determined from an independent previous study of the Amoco Outfall 001 that mapped the dispersion zone using a dye, computer modeling efforts, and field observations. If ecological parameters were not different between areas known to be within the effluent dispersion zone and areas known to be beyond the zone of dispersion, then the logical inference is that Amoco's effluent is not adversely impacting the lake ecology in the area where dispersion takes place. The Amoco discharge enters a shallow cove at the southern end of Lake Michigan, and the study stations are located within areas defined as the jet entrainment zone or zone-of-initial dilution (ZID) and the far-field mixing zone or total mixing zone. The reference or background area is located outside the edge of the far-field mixing zone.

## 1.2 Study Design

The approach chosen was to evaluate a series of stations beginning near Amoco's Outfall 001 and proceeding away from the outfall. The samples collected would represent the existing ecological communities along this progression at six specific sample sites. The sample locations were chosen to reflect points inside and points outside the area of effluent dispersion. Gross

## FIGURE 1-1

### Conceptual Community Sensitivity



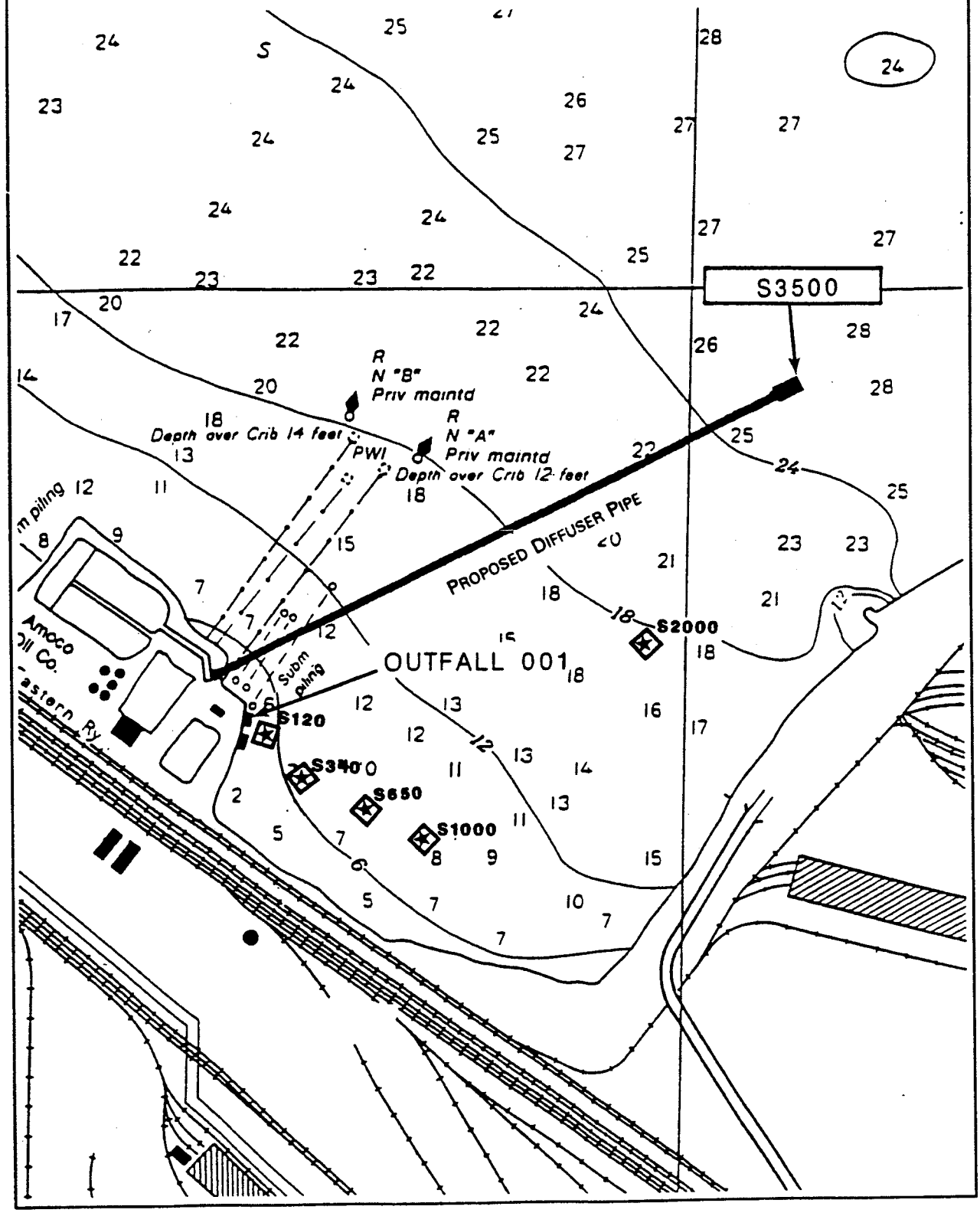
Figure, sessile organisms exhibit the highest potential for detecting an effect of exposure, followed by drifting and mobile organisms.

Consistent with the study design which compares biological collections from inside and outside the effluent dispersion zone, two sites were selected to assess possible differences in periphytic (attached) filamentous algae along the shore. Samples of filamentous algae were collected from shore rocks adjacent to Outfall 001 to represent the "inside dispersion zone" sample locations, and filamentous algae were collected from shore rocks near the Whihala Beach and Whiting City Park shooting range to represent "outside the dispersion zone" sites. Dispersion and trajectory studies have indicated that the filamentous shore algae has limited exposure to Amoco's effluent because of local current and prevailing wind patterns. However, the study was conducted to investigate possible influential effects from the effluent discharge on this specific biological community.

An evaluation of the plankton community included determination of chlorophyll-a from the study locations. Chlorophyll-a concentrations helped confirm trophic conditions for the southern Lake Michigan region associated with this study, and were used to evaluate potential differences between the sites located inside to effluent dispersion zone to sites outside the dispersion zone.

Functional tests can be used to evaluate the effects of the discharge waters on the overall ecological health of the plankton community. Typical tests include the standard light/dark bottle technique to determine primary production and respiration rates of the plankton over a designated time period as measured by dissolved oxygen or carbon tracer ($C^{14}$ isotope). Field evaluation (secchi depth), initial microscopical evaluation of plankton samples, and laboratory determination of chlorophyll-a indicated phytoplankton biomass may be too sparse for meaningful results. Therefore, functional tests to evaluate the effect of the Amoco 001 discharge waters on the overall health and productivity of phytoplankton utilized laboratory algal bioassay procedures. Lake Michigan water collected from the study sites within the zone of effluent dispersion, and a site well outside the zone of effluent dispersion were inoculated with known

# ATTACHMENT 5
# FIGURE 1-2
# AMOCO BIOASSESSMENT FIELD SAMPLING STATIONS



at site S650. Standard field techniques were used to sample the different segments of the aquatic community, including plants floating in the water (phytoplankton), plants attached to artificial surfaces and rocks (periphyton), small animals floating in the water (zooplankton), and small organisms living on the bottom (benthos).

The nature of the Amoco Cove is characteristic of a flooded beach zone (USFWS 1970) which has extremely turbulent, unstable and highly fluctuating physical conditions. The present biological assessment serves as representation of a very dynamic environment with highly variable characteristics. To maximize understanding of a highly variable biological and physical system, a sampling approach of more samples at fewer stations was adopted. In such environmental variability there is a normal biological and sampling variability.

In evaluating aquatic communities, ecologists often use indices of species diversity, evenness and richness, as well as number of organisms per volume (density). These indices permit comparison of large tables of data and overall evaluation of the ecosystem. For example, diversity indices measure the distribution of different species found in a sample. Healthy communities typically have a relatively high diversity--many species of organisms filling several different niches. Stressed communities often have a lower diversity because the most sensitive species cannot tolerate the stress and the more tolerant species have taken over their niches. Commonly used community structure parameters such as taxonomic richness, measures of diversity, organism density, and taxonomic similarity were the focus for biological comparisons.

| | | | |
|---|---|---|---|
| Hill's N1 | | | |
| Mixzone | Lake | | |
| 5.44 | 4.21 | | |
| 7.2 | 5.21 | | |
| 5.53 | 4.76 | | |
| 8.12 | 4.53 | | |
| | | | |
| | | *HILL'S N1* | |
| | | Mixzone | Lake |
| Mean | | 6.5725 | 4.6775 |
| Standard Error | | 0.655609 | 0.210292 |
| Median | | 6.365 | 4.645 |
| Mode | | #N/A | #N/A |
| Standard Deviation | | 1.311218 | 0.420585 |
| Variance | | 1.719292 | 0.176892 |
| Kurtosis | | -3.67128 | 0.209164 |
| Skewness | | 0.404394 | 0.413731 |
| Range | | 2.68 | 1 |
| Minimum | | 5.44 | 4.21 |
| Maximum | | 8.12 | 5.21 |
| Sum | | 26.29 | 18.71 |
| Count | | 4 | 4 |

# ANOVA

# Amoco Cove Benthos

| Simpson's Diversity | |
|---|---|
| Mixzone | Lake |
| 0 | 0.513 |
| 1 | 0.675 |
| 0 | 0.928 |
| 1 | 0.721 |
| 1 | 0.766 |
| | 0.729 |
| | 0.846 |
| | 0.744 |
| | 0.909 |
| | 0.864 |
| | 0.815 |
| | 0.364 |
| | 0.6 |
| | 0.666 |
| | 0.1 |
| | 0.439 |

**Benthos - Simpson's Diversity**
Anova: Single-Factor

Summary

| *Groups* | *Count* | *Sum* | *Average* | *Variance* |
|---|---|---|---|---|
| Mixzone | 5 | 3 | 0.6 | 0.3 |
| Lake | 16 | 10.679 | 0.6674375 | 0.049031862 |

ANOVA

| Source of Variation | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
|---|---|---|---|---|---|---|
| Between Grou | 0.017325015 | 1 | 0.017325015 | 0.170074417 | 0.684661693 | 4.380751761 |
| Within Group | 1.935477938 | 19 | 0.10186726 | | | |
| Total | 1.952802952 | 20 | | | | |

# Amoco Cove Benthos

| Richness | |
|---|---|
| Mixzone | Lake |
| 2 | 3 |
| 1 | 2 |
| 2 | 2 |
| 1 | 3 |
| 1 | 2 |
| | 2 |
| | 2 |
| | 3 |
| | 2 |
| | 2 |
| | 2 |
| | 5 |
| | 2 |
| | 2 |
| | 4 |
| | 4 |

**Benthos - Richness (Log10 Transformation)**

| Mixzone | Lake |
|---|---|
| 0.301029996 | 0.477121255 |
| 0 | 0.301029996 |
| 0.301029996 | 0.301029996 |
| 0 | 0.477121255 |
| 0 | 0.301029996 |
| | 0.301029996 |
| | 0.301029996 |
| | 0.477121255 |
| | 0.301029996 |
| | 0.301029996 |
| | 0.301029996 |
| | 0.698970004 |
| | 0.301029996 |
| | 0.301029996 |
| | 0.602059991 |
| | 0.602059991 |

**Benthos - Richness**
Anova: Single-Factor

Summary

| *Groups* | *Count* | *3* | *Average* | *Variance* |
|---|---|---|---|---|
| Mixzone | 5 | 0.60205999 | 0.120411998 | 0.027185717 |
| Lake | 16 | 6.34475371 | 0.396547107 | 0.019109498 |

ANOVA

| Source of Variation | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
|---|---|---|---|---|---|---|
| Between Groups | 0.290478469 | 1 | 0.290478469 | 13.95876482 | 0.001399522 | 4.380751761 |
| Within Groups | 0.395385335 | 19 | 0.020809754 | | | |
| Total | 0.685863805 | 20 | | | | |

# Amoco Cove Benthos

| Evenness | |
|---|---|
| Mixzone | Lake |
| 1 | 0.858 |
| 1 | 0.776 |
| 1 | 0.461 |
| 1 | 0.569 |
| 1 | 0.665 |
| | 0.692 |
| | 0.583 |
| | 0.549 |
| | 0.492 |
| | 0.532 |
| | 0.582 |
| | 0.814 |
| | 1.02 |
| | 0.878 |
| | 3.22 |
| | 0.762 |

**Benthos - Evenness (Log10 Transformation)**

| Mixzone | Lake |
|---|---|
| 0 | -0.066512712 |
| 0 | -0.110138279 |
| 0 | -0.336299075 |
| 0 | -0.244887734 |
| 0 | -0.177178355 |
| | -0.159893906 |
| | -0.234331445 |
| | -0.260427656 |
| | -0.308034897 |
| | -0.274088368 |
| | -0.235077015 |
| | -0.089375595 |
| | 0.008600172 |
| | -0.056505484 |
| | 0.507855872 |
| | -0.118045029 |

**Benthos - Evenness**

Anova: Single-Factor

Summary

| *Groups* | *Count* | *Sum* | *Average* | *Variance* |
|---|---|---|---|---|
| Mixzone | 5 | 0 | 0 | 0 |
| Lake | 16 | -2.154339505 | -0.134646219 | 0.039174532 |

ANOVA

| Source of Variation | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
|---|---|---|---|---|---|---|
| Between Groups | 0.069065159 | 1 | 0.069065159 | 2.233148179 | 0.151501447 | 4.380751761 |
| Within Groups | 0.587617982 | 19 | 0.030927262 | | | |
| Total | 0.656683141 | 20 | | | | |

# Amoco Cove Benthos

Shannon Weiner Diversity

| Mixzone | Lake |
|---|---|
| 0.693 | 0.743 |
| 0 | 0.482 |
| 0.693 | 0.154 |
| 0 | 0.518 |
| 0 | 1.376 |
| | 0.429 |
| | 0.271 |
| | 0.485 |
| | 0.184 |
| | 0.257 |
| | 0.327 |
| | 1.143 |
| | 0.5 |
| | 0.45 |
| | 1.332 |
| | 0.983 |

Benthos - Shannon Weiner Diversity

Anova: Single-Factor

Summary

| *Groups* | *Count* | *Sum* | *Average* | *Variance* |
|---|---|---|---|---|
| Mixzone | 5 | 1.386 | 0.2772 | 0.1440747 |
| Lake | 16 | 9.634 | 0.602125 | 0.157861317 |

ANOVA

| Source of Variation | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
|---|---|---|---|---|---|---|
| Between Grou | 0.40219526 | 1 | 0.40219526 | 2.595496836 | 0.123655869 | 4.380751761 |
| Within Groups | 2.94421855 | 19 | 0.154958871 | | | |
| Total | 3.34641381 | 20 | | | | |

# Amoco Cove Benthos

| Hill's N1 | |
|---|---|
| Mixzone | Lake |
| 2 | 2.1 |
| 1 | 1.62 |
| 2 | 1.16 |
| 1 | 1.67 |
| 1 | 1.45 |
| | 1.53 |
| | 1.31 |
| | 1.62 |
| | 1.2 |
| | 1.29 |
| | 1.38 |
| | 3.13 |
| | 1.64 |
| | 1.56 |
| | 3.78 |
| | 2.67 |

| Benthos - Hill's N1 | |
|---|---|
| Mixzone | Lake |
| 0.301029996 | 0.322219295 |
| 0 | 0.209515015 |
| 0.301029996 | 0.064457989 |
| 0 | 0.222716471 |
| 0 | 0.161368002 |
| | 0.184691431 |
| | 0.117271296 |
| | 0.209515015 |
| | 0.079181246 |
| | 0.11058971 |
| | 0.139879086 |
| | 0.495544338 |
| | 0.214843848 |
| | 0.193124598 |
| | 0.5774918 |
| | 0.426511261 |

Benthos - Hill's N1
Anova: Single-Factor

Summary

| *Groups* | *Count* | *Sum* | *Average* | *Variance* |
|---|---|---|---|---|
| Mixzone | 5 | 0.602059991 | 0.120411998 | 0.027185717 |
| Lake | 16 | 3.728920401 | 0.233057525 | 0.022181313 |

ANOVA

| Source of Variation | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
|---|---|---|---|---|---|---|
| Between Groups | 0.048339104 | 1 | 0.048339104 | 2.08045492 | 0.165478422 | 4.380751761 |
| Within Groups | 0.441462567 | 19 | 0.023234872 | | | |
| Total | 0.48980167 | 20 | | | | |

# Amoco Cove Benthos

| Hill's N1 | |
|---|---|
| Mixzone | Lake |
| 2 | 2.1 |
| 1 | 1.62 |
| 2 | 1.16 |
| 1 | 1.67 |
| 1 | 1.45 |
| | 1.53 |
| | 1.31 |
| | 1.62 |
| | 1.2 |
| | 1.29 |
| | 1.38 |
| | 3.13 |
| | 1.64 |
| | 1.56 |
| | 3.78 |
| | 2.67 |

| Benthos - Hill's N1 | |
|---|---|
| Mixzone | Lake |
| 0.301029996 | 0.322219295 |
| 0 | 0.209515015 |
| 0.301029996 | 0.064457989 |
| 0 | 0.222716471 |
| 0 | 0.161368002 |
| | 0.184691431 |
| | 0.117271296 |
| | 0.209515015 |
| | 0.079181246 |
| | 0.11058971 |
| | 0.139879086 |
| | 0.495544338 |
| | 0.214843848 |
| | 0.193124598 |
| | 0.5774918 |
| | 0.426511261 |

Benthos - Hill's N1
Anova: Single-Factor

Summary

| *Groups* | *Count* | *Sum* | *Average* | *Variance* |
|---|---|---|---|---|
| Mixzone | 5 | 0.602059991 | 0.120411998 | 0.027185717 |
| Lake | 16 | 3.728920401 | 0.233057525 | 0.022181313 |

ANOVA

| Source of Variation | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
|---|---|---|---|---|---|---|
| Between Groups | 0.048339104 | 1 | 0.048339104 | 2.08045492 | 0.165478422 | 4.380751761 |
| Within Groups | 0.441462567 | 19 | 0.023234872 | | | |
| Total | 0.48980167 | 20 | | | | |

# Amoco Cove Phytoplankton

| Simpson's Diversity | |
|---|---|
| Mixzone | Lake |
| 0.146 | 0.166 |
| 0.113 | 0.195 |
| 0.208 | 0.187 |
| 0.166 | 0.188 |
| 0.199 | 0.182 |
| 0.186 | 0.19 |
| 0.238 | 0.256 |
| 0.224 | 0.145 |
| | 0.169 |
| | 0.273 |
| | 0.187 |
| | 0.161 |
| | 0.161 |
| | 0.224 |

| Phytoplankton - Simpson's Diversity (Log10 Transformation) | |
|---|---|
| Mixzone | Lake |
| -0.835647144 | -0.7798919 |
| -0.946921557 | -0.7099654 |
| -0.681936665 | -0.7281584 |
| -0.779891912 | -0.7258422 |
| -0.701146924 | -0.7399286 |
| -0.730487056 | -0.7212464 |
| -0.623423043 | -0.59176 |
| -0.649751982 | -0.838632 |
| | -0.7721133 |
| | -0.5638374 |
| | -0.7281584 |
| | -0.7931741 |
| | -0.7931741 |
| | -0.649752 |

**Phytoplankton - Simpson's Diversity**

Anova: Single-Factor

Summary

| *Groups* | *Count* | *Sum* | *Average* | *Variance* |
|---|---|---|---|---|
| Mixzone | 8 | -5.9492063 | -0.7436508 | 0.0114508 |
| Lake | 14 | -10.135634 | -0.7239739 | 0.005946 |

ANOVA

| Source of Variation | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
|---|---|---|---|---|---|---|
| Between Groups | 0.0019711 | 1 | 0.0019711 | 0.2503722 | 0.622274523 | 4.351250027 |
| Within Groups | 0.15745385 | 20 | 0.00787269 | | | |
| Total | 0.15942495 | 21 | | | | |

# Amoco Cove Phytoplankton

| Richness | |
|---|---|
| Mixzone | Lake |
| 36 | 26 |
| 36 | 25 |
| 34 | 27 |
| 35 | 30 |
| 34 | 32 |
| 35 | 27 |
| 33 | 31 |
| 35 | 29 |
| | 31 |
| | 30 |
| | 26 |
| | 26 |
| | 26 |
| | 24 |

**Phytoplankton - Richness**

Anova: Single-Factor

Summary

| *Groups* | *Count* | *Sum* | *Average* | *Variance* |
|---|---|---|---|---|
| Mixzone | 8 | 278 | 34.75 | 1.07142857 |
| Lake | 14 | 390 | 27.8571429 | 6.59340659 |

ANOVA

| Source of Variation | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
|---|---|---|---|---|---|---|
| Between Groups | 241.876623 | 1 | 241.876623 | 51.8969 | 5.6579E-07 | 4.351250027 |
| Within Groups | 93.2142857 | 20 | 4.66071429 | | | |
| Total | 335.090909 | 21 | | | | |

# Amoco Cove Phytoplankton

| Evenness | |
|---|---|
| Mixzone | Lake |
| 0.661 | 0.583 |
| 0.748 | 0.602 |
| 0.531 | 0.567 |
| 0.71 | 0.65 |
| 0.58 | 0.633 |
| 0.599 | 0.644 |
| 0.56 | 0.558 |
| 0.563 | 0.704 |
| | 0.635 |
| | 0.483 |
| | 0.657 |
| | 0.669 |
| | 0.615 |
| | 0.671 |

**Phytoplankton - Evenness**

Anova: Single-Factor

Summary

| *Groups* | *Count* | *Sum* | *Average* | *Variance* |
|---|---|---|---|---|
| Mixzone | 8 | 4.952 | 0.619 | 0.00613829 |
| Lake | 14 | 8.671 | 0.61935714 | 0.00326394 |

ANOVA

| Source of Variation | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
|---|---|---|---|---|---|---|
| Between Groups | 6.4935E-07 | 1 | 6.4935E-07 | 0.00015207 | 0.99028305 | 4.35125003 |
| Within Groups | 0.08539921 | 20 | 0.00426996 | | | |
| Total | 0.08539986 | 21 | | | | |

# Amoco Cove Phytoplankton

| Shannon-Weiner Diversity | |
|---|---|
| Mixzone | Lake |
| 2.281 | 2.261 |
| 2.441 | 2.058 |
| 2.099 | 2.158 |
| 2.082 | 2.029 |
| 2.068 | 2.088 |
| 2.114 | 2.028 |
| 1.901 | 1.822 |
| 1.962 | 2.234 |
| | 2.162 |
| | 1.869 |
| | 2.026 |
| | 2.17 |
| | 2.245 |
| | 1.815 |

**Phytoplankton - Shannon-Weiner Diversity**

Anova: Single-Factor

Summary

| *Groups* | *Count* | *Sum* | *Average* | *Variance* |
|---|---|---|---|---|
| Mixzone | 8 | 16.948 | 2.1185 | 0.02949914 |
| Lake | 14 | 28.965 | 2.0689286 | 0.02253638 |

ANOVA

| Source of Variation | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
|---|---|---|---|---|---|---|
| Between Groups | 0.01251003 | 1 | 0.01251 | 0.50093511 | 0.48725635 | 4.351250027 |
| Within Groups | 0.49946693 | 20 | 0.0249733 | | | |
| Total | 0.51197695 | 21 | | | | |

# Amoco Cove Phytoplankton

| Mixzone | % Richness Lake |
|---|---|
| 54.39 | 47.95 |
| 63.78 | 48.94 |
| 48 | 45.53 |
| 53.47 | 54.29 |
| 46.47 | 53.8 |
| 43.58 | 44.71 |
| 44.65 | 36.35 |
| 44.44 | 46.7 |
| | 45.74 |
| | 40.5 |
| | 54.14 |
| | 54.75 |
| | 47.2 |
| | 47.23 |

**Phytoplankton - % Richness**

Anova: Single-Factor

Summary

| *Groups* | *Count* | *Sum* | *Average* | *Variance* |
|---|---|---|---|---|
| Mixzone | 8 | 398.78 | 49.8475 | 48.3183929 |
| Lake | 14 | 667.83 | 47.7021429 | 28.6952489 |

ANOVA

Source of Variation

| | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
|---|---|---|---|---|---|---|
| Between Groups | 23.4312006 | 1 | 23.4312006 | 0.6588581 | 0.42651892 | 4.351250027 |
| Within Groups | 711.266986 | 20 | 35.5633493 | | | |
| Total | 734.698186 | 21 | | | | |

# Amoco Cove Phytoplankton

| Hill's N1 | |
|---|---|
| Mixzone | Lake |
| 9.79 | 9.59 |
| 11.48 | 7.83 |
| 8.16 | 8.65 |
| 8.02 | 7.6 |
| 7.9 | 8.07 |
| 8.28 | 7.6 |
| 6.698 | 6.18 |
| 7.11 | 9.34 |
| | 8.69 |
| | 6.48 |
| | 7.58 |
| | 8.76 |
| | 9.44 |
| | 6.14 |

**Phytoplankton - Hill's N1**

Anova: Single-Factor

Summary

| *Groups* | *Count* | *Sum* | *Average* | *Variance* |
|---|---|---|---|---|
| Mixzone | 8 | 67.438 | 8.42975 | 2.34838907 |
| Lake | 14 | 111.95 | 7.99642857 | 1.34507088 |

ANOVA

| Source of Variation | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
|---|---|---|---|---|---|---|
| Between Groups | 0.95590707 | 1 | 0.95590707 | 0.56354728 | 0.46157617 | 4.351250027 |
| Within Groups | 33.9246449 | 20 | 1.69623225 | | | |
| Total | 34.880552 | 21 | | | | |

# Amoco Cove Zooplankton

| Richness | |
|---|---|
| Mixzone | Lake |
| 12 | 11 |
| 13 | 12 |
| 11 | 11 |
| 11 | 13 |
| 10 | 13 |
| 10 | 15 |

**Zooplankton - Richness**

Anova: Single-Factor

Summary

| *Groups* | *Count* | *Sum* | *Average* | *Variance* |
|---|---|---|---|---|
| Mixzone | 6 | 67 | 11.1666667 | 1.36666667 |
| Lake | 6 | 75 | 12.5 | 2.3 |

ANOVA

Source of Variation

| | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
|---|---|---|---|---|---|---|
| Between Groups | 5.33333333 | 1 | 5.33333333 | 2.90909091 | 0.11889393 | 4.96459052 |
| Within Groups | 18.3333333 | 10 | 1.83333333 | | | |
| Total | 23.6666667 | 11 | | | | |

# Amoco Cove Phytoplankton

| Density | |
|---|---|
| Mixzone | Lake |
| 3.11 | 3.53 |
| 2.66 | 2.16 |
| 1.76 | 3.96 |
| 3.62 | 2.04 |
| 2.2 | 2.94 |
| 2.43 | 3.97 |
| 2.11 | 2.61 |
| 2.8 | 2.77 |
| | 1.69 |
| | 2.05 |
| | 2.97 |
| | 2.32 |
| | 2.44 |
| | 6.44 |

**Phytoplankton - Density (Log10 Transformation)**

| Mixzone | Lake |
|---|---|
| 0.492760389 | 0.54777471 |
| 0.424881637 | 0.33445375 |
| 0.245512668 | 0.59769519 |
| 0.558708571 | 0.30963017 |
| 0.342422681 | 0.46834733 |
| 0.385606274 | 0.59879051 |
| 0.324282455 | 0.41664051 |
| 0.447158031 | 0.44247977 |
| | 0.2278867 |
| | 0.31175386 |
| | 0.47275645 |
| | 0.36548798 |
| | 0.38738983 |
| | 0.80888587 |

**Phytoplankton - Density**

Anova: Single-Factor

Summary

| *Groups* | *Count* | *Sum* | *Average* | *Variance* |
|---|---|---|---|---|
| Mixzone | 8 | 3.22133271 | 0.40266659 | 0.00995726 |
| Lake | 14 | 6.28997262 | 0.44928376 | 0.0228378 |

ANOVA

| Source of Variation | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
|---|---|---|---|---|---|---|
| Between Groups | 0.01106336 | 1 | 0.01106336 | 0.60357874 | 0.44630797 | 4.35125003 |
| Within Groups | 0.3665922 | 20 | 0.01832961 | | | |
| Total | 0.37765556 | 21 | | | | |

# Amoco Cove Zooplankton

| Shannon-Weiner Diversity | |
|---|---|
| **Mixzone** | **Lake** |
| 0.762 | 0.572 |
| 0.588 | 0.479 |
| 0.82 | 0.527 |
| 0.497 | 0.878 |
| 0.261 | 0.915 |
| 0.146 | 1.06 |

**Zooplankton - Shannon-Weiner Diversity**

Anova: Single-Factor

Summary

| *Groups* | *Count* | *Sum* | *Average* | *Variance* |
|---|---|---|---|---|
| Mixzone | 6 | 3.074 | 0.5123333 | 0.07206427 |
| Lake | 6 | 4.431 | 0.7385 | 0.0587539 |

ANOVA

Source of Variation

| | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
|---|---|---|---|---|---|---|
| Between Groups | 0.15345408 | 1 | 0.1534541 | 2.34606687 | 0.15660117 | 4.964590516 |
| Within Groups | 0.65409083 | 10 | 0.0654091 | | | |
| Total | 0.80754492 | 11 | | | | |

# Amoco Cove Zooplankton

| Simpson's Diversity | |
|---|---|
| Mixzone | Lake |
| 0.699 | 0.777 |
| 0.746 | 0.821 |
| 0.64 | 0.797 |
| 0.81 | 0.462 |
| 0.9 | 0.459 |
| 0.955 | 0.426 |

**Zooplankton - Simpson's Diversity**

Anova: Single-Factor

Summary

| *Groups* | *Count* | *Sum* | *Average* | *Variance* |
|---|---|---|---|---|
| Mixzone | 6 | 4.75 | 0.79166667 | 0.0144851 |
| Lake | 6 | 3.742 | 0.62366667 | 0.0369639 |

ANOVA

Source of Variation

| | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
|---|---|---|---|---|---|---|
| Between Groups | 0.084672 | 1 | 0.084672 | 3.2914968 | 0.099708798 | 4.964590516 |
| Within Groups | 0.25724467 | 10 | 0.02572447 | | | |
| Total | 0.34191667 | 11 | | | | |

# Amoco Cove Zooplankton

| Hill's N1 | |
|---|---|
| Mixzone | Lake |
| 2.1 | 1.7 |
| 1.8 | 1.6 |
| 2.3 | 1.7 |
| 1.6 | 2.4 |
| 1.3 | 2.4 |
| 1.1 | 2.8 |

**Zooplankton - Hill's N1**

Anova: Single-Factor

Summary

| *Groups* | *Count* | *Sum* | *Average* | *Variance* |
|---|---|---|---|---|
| Mixzone | 6 | 10.2 | 1.7 | 0.212 |
| Lake | 6 | 12.6 | 2.1 | 0.248 |

ANOVA

Source of Variation

| | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
|---|---|---|---|---|---|---|
| Between Groups | 0.48 | 1 | 0.48 | 2.08695652 | 0.17915573 | 4.964590516 |
| Within Groups | 2.3 | 10 | 0.23 | | | |
| Total | 2.78 | 11 | | | | |

# Amoco Cove Zooplankton

| Evenness | |
|---|---|
| Mixzone | Lake |
| 0.376 | 0.369 |
| 0.423 | 0.353 |
| 0.417 | 0.365 |
| 0.361 | 0.826 |
| 0.353 | 0.785 |
| 0.296 | 0.71 |

**Zooplankton - Evenness**

Anova: Single-Factor

Summary

| *Groups* | *Count* | *Sum* | *Average* | *Variance* |
|---|---|---|---|---|
| Mixzone | 6 | 2.226 | 0.371 | 0.0021788 |
| Lake | 6 | 3.408 | 0.568 | 0.0521704 |

ANOVA

| Source of Variation | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
|---|---|---|---|---|---|---|
| Between Groups | 0.116427 | 1 | 0.116427 | 4.28440529 | 0.06529685 | 4.96459052 |
| Within Groups | 0.271746 | 10 | 0.0271746 | | | |
| Total | 0.388173 | 11 | | | | |

# Amoco Cove
# Float Periphyton

| Richness | |
|---|---|
| Mixzone | Lake |
| 21 | 22 |
| 22 | 22 |
| 23 | 22 |
| 24 | 27 |
| 17 | 26 |
| 18 | 27 |
| | 26 |

**Float Periphyton - Richness**

Anova: Single-Factor

Summary

| *Groups* | *Count* | *Sum* | *Average* | *Variance* |
|---|---|---|---|---|
| Mixzone | 6 | 125 | 20.8333333 | 7.76666667 |
| Lake | 7 | 172 | 24.5714286 | 5.95238095 |

ANOVA

Source of Variation

| | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
|---|---|---|---|---|---|---|
| Between Groups | 45.1446886 | 1 | 45.1446886 | 6.66140088 | 0.02554615 | 4.84433826 |
| Within Groups | 74.547619 | 11 | 6.77705628 | | | |
| Total | 119.692308 | 12 | | | | |

# Amoco Cove Zooplankton

| Density | |
|---|---|
| Mixzone | Lake |
| 11.46 | 10.66 |
| 20.78 | 10.28 |
| 12.89 | 17.98 |
| 10.11 | 27.73 |
| 33.33 | 13.65 |
| 42.77 | 12.72 |

**Zooplankton - Density**

Anova: Single-Factor

Summary

| *Groups* | *Count* | *Sum* | *Average* | *Variance* |
|---|---|---|---|---|
| Mixzone | 6 | 131.34 | 21.89 | 179.32668 |
| Lake | 6 | 93.02 | 15.5033333 | 43.5096267 |

ANOVA

Source of Variation

| | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
|---|---|---|---|---|---|---|
| Between Groups | 122.368533 | 1 | 122.368533 | 1.09828183 | 0.31931204 | 4.96459052 |
| Within Groups | 1114.18153 | 10 | 111.418153 | | | |
| Total | 1236.55007 | 11 | | | | |

# Amoco Cove
# Float Periphyton

| Shannon-Weiner Diversity | |
|---|---|
| **Mixzone** | **Lake** |
| 1.49 | 1.69 |
| 1.75 | 1.51 |
| 1.7 | 1.64 |
| 2 | 1.63 |
| 1.48 | 1.49 |
| 1.47 | 1.69 |
| | 1.68 |

**Float Periphyton - Shannon-Weiner Diversity**

Anova: Single-Factor

Summary

| *Groups* | *Count* | *Sum* | *Average* | *Variance* |
|---|---|---|---|---|
| Mixzone | 6 | 9.89 | 1.6483333 | 0.04437667 |
| Lake | 7 | 11.33 | 1.6185714 | 0.00714762 |

ANOVA

Source of Variation

| | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
|---|---|---|---|---|---|---|
| Between Groups | 0.00286172 | 1 | 0.0028617 | 0.11889206 | 0.73674176 | 4.844338264 |
| Within Groups | 0.26476905 | 11 | 0.0240699 | | | |
| Total | 0.26763077 | 12 | | | | |

# Amoco Cove
# Float Periphyton

**Simpson's Diversity**

| Mixzone | Lake |
|---|---|
| 0.22 | 0.17 |
| 0.15 | 0.19 |
| 0.15 | 0.17 |
| 0.11 | 0.17 |
| 0.22 | 0.19 |
| 0.2 | 0.15 |
| | 0.15 |

**Float Periphyton - Simpson's Diversity (Log10 Transformation)**

| Mixzone | Lake |
|---|---|
| -0.657577319 | -0.7695511 |
| -0.823908741 | -0.7212464 |
| -0.823908741 | -0.7695511 |
| -0.958607315 | -0.7695511 |
| -0.657577319 | -0.7212464 |
| -0.698970004 | -0.8239087 |
| | -0.8239087 |

**Float Periphyton - Simpson's Diversity**

Anova: Single-Factor

Summary

| *Groups* | *Count* | *Sum* | *Average* | *Variance* |
|---|---|---|---|---|
| Mixzone | 6 | -4.6205494 | -0.7700916 | 0.0143416 |
| Lake | 7 | -5.3989635 | -0.7712805 | 0.0017592 |

ANOVA

Source of Variation

| | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
|---|---|---|---|---|---|---|
| Between Groups | 4.5669E-06 | 1 | 4.5669E-06 | 0.0006107 | 0.980727529 | 4.844338264 |
| Within Groups | 0.08226321 | 11 | 0.00747847 | | | |
| Total | 0.08226778 | 12 | | | | |

# Amoco Cove
# Float Periphyton

| Hill's N1 | |
|---|---|
| Mixzone | Lake |
| 4.4 | 5.4 |
| 5.7 | 5.3 |
| 5.4 | 5.1 |
| 7.4 | 5.1 |
| 4.4 | 4.8 |
| 4.3 | 5.4 |
| | 5.3 |

**Float Periphyton - Hill's N1**

Anova: Single-Factor

Summary

| *Groups* | *Count* | *Sum* | *Average* | *Variance* |
|---|---|---|---|---|
| Mixzone | 6 | 31.6 | 5.26666667 | 1.43866667 |
| Lake | 7 | 36.4 | 5.2 | 0.04666667 |

ANOVA

Source of Variation

| | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
|---|---|---|---|---|---|---|
| Between Groups | 0.01435897 | 1 | 0.01435897 | 0.02113498 | 0.88704155 | 4.844338264 |
| Within Groups | 7.47333333 | 11 | 0.67939394 | | | |
| Total | 7.48769231 | 12 | | | | |

# Amoco Cove
# Float Periphyton

| Evenness | |
|---|---|
| Mixzone | Lake |
| 1.03 | 1.11 |
| 1.17 | 1.22 |
| 1.24 | 1.19 |
| 1.2 | 1.19 |
| 1.03 | 1.21 |
| 1.18 | 1.24 |
| | 1.22 |

**Float Periphyton - Evenness (Log10 Transformation)**

| Mixzone | Lake |
|---|---|
| 0.012837225 | 0.04532298 |
| 0.068185862 | 0.08635983 |
| 0.093421685 | 0.07554696 |
| 0.079181246 | 0.07554696 |
| 0.012837225 | 0.08278537 |
| 0.071882007 | 0.09342169 |
| | 0.08635983 |

**Float Periphyton - Evenness**

Anova: Single-Factor

Summary

| *Groups* | *Count* | *Sum* | *Average* | *Variance* |
|---|---|---|---|---|
| Mixzone | 6 | 0.33835 | 0.05639087 | 0.00121272 |
| Lake | 7 | 0.54534 | 0.07790623 | 0.00024671 |

ANOVA

| Source of Variation | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
|---|---|---|---|---|---|---|
| Between Groups | 0.00149556 | 1 | 0.00149556 | 2.18072448 | 0.16779534 | 4.84433826 |
| Within Groups | 0.00754388 | 11 | 0.00068581 | | | |
| Total | 0.00903944 | 12 | | | | |

# Amoco Cove
## Shore Periphyton

| Richness | |
|---|---|
| Mixzone | Lake |
| 6 | 5 |
| 8 | 6 |
| 6 | 6 |
| 10 | 5 |

**Shore Periphyton - Richness**

Anova: Single-Factor

Summary

| *Groups* | *Count* | *Sum* | *Average* | *Variance* |
|---|---|---|---|---|
| Mixzone | 4 | 30 | 7.5 | 3.66666667 |
| Lake | 4 | 22 | 5.5 | 0.33333333 |

ANOVA

Source of Variation

| | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
|---|---|---|---|---|---|---|
| Between Groups | 8 | 1 | 8 | 4 | 0.09242631 | 5.98737415 |
| Within Groups | 12 | 6 | 2 | | | |
| Total | 20 | 7 | | | | |

# Amoco Cove
# Float Periphyton

| Density | |
|---|---|
| Mixzone | Lake |
| 7.47 | 8.97 |
| 8.09 | 5.16 |
| 5.57 | 6.4 |
| 3.86 | 5.22 |
| 8.13 | 4.94 |
| 6.3 | 7.1 |
| | 8.13 |

**Float Periphyton - Density**

Anova: Single-Factor

Summary

| *Groups* | *Count* | *Sum* | *Average* | *Variance* |
|---|---|---|---|---|
| Mixzone | 6 | 39.42 | 6.57 | 2.7942 |
| Lake | 7 | 45.92 | 6.56 | 2.49503333 |

ANOVA

| Source of Variation | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
|---|---|---|---|---|---|---|
| Between Groups | 0.00032308 | 1 | 0.00032308 | 0.0001228 | 0.991357 | 4.84433826 |
| Within Groups | 28.9412 | 11 | 2.63101818 | | | |
| Total | 28.9415231 | 12 | | | | |

# Amoco Cove
# Shore Periphyton

Simpson's Diversity

| Mixzone | Lake |
|---|---|
| 0.16 | 0.18 |
| 0.09 | 0.21 |
| 0.14 | 0.16 |
| 0.11 | 0.19 |

Shore Periphyton - Simpson's Diversity (Log10 Transformation)

| Mixzone | Lake |
|---|---|
| -0.795880017 | -0.7447275 |
| -1.045757491 | -0.6777807 |
| -0.853871964 | -0.79588 |
| -0.958607315 | -0.7212464 |

Shore Periphyton - Simpson's Diversity

Anova: Single-Factor

Summary

| *Groups* | *Count* | *Sum* | *Average* | *Variance* |
|---|---|---|---|---|
| Mixzone | 4 | -3.6541168 | -0.9135292 | 0.0123056 |
| Lake | 4 | -2.9396346 | -0.7349087 | 0.0024214 |

ANOVA

| Source of Variation | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
|---|---|---|---|---|---|---|
| Between Groups | 0.0638106 | 1 | 0.0638106 | 8.6658265 | 0.025820665 | 5.987374152 |
| Within Groups | 0.04418085 | 6 | 0.00736347 | | | |
| Total | 0.10799145 | 7 | | | | |

# Amoco Cove
## Shore Periphyton

| Shannon-Weiner Diversity | |
|---|---|
| Mixzone | Lake |
| 1.69 | 1.43 |
| 1.97 | 1.65 |
| 1.71 | 1.56 |
| 2.19 | 1.52 |

**Shore Periphyton - Shannon-Weiner Diversity**

Anova: Single-Factor

Summary

| *Groups* | *Count* | *Sum* | *Average* | *Variance* |
|---|---|---|---|---|
| Mixzone | 4 | 7.56 | 1.89 | 0.05626667 |
| Lake | 4 | 6.16 | 1.54 | 0.00833333 |

ANOVA

Source of Variation

| | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
|---|---|---|---|---|---|---|
| Between Groups | 0.245 | 1 | 0.245 | 7.58513932 | 0.03311094 | 5.987374152 |
| Within Groups | 0.1938 | 6 | 0.0323 | | | |
| Total | 0.4388 | 7 | | | | |

# Amoco Cove
# Shore Periphyton

| Hill's N1 | |
|---|---|
| Mixzone | Lake |
| 5.44 | 4.21 |
| 7.2 | 5.21 |
| 5.53 | 4.76 |
| 8.12 | 4.53 |

**Shore Periphyton - Hill's N1**

Anova: Single-Factor

Summary

| *Groups* | *Count* | *Sum* | *Average* | *Variance* |
|---|---|---|---|---|
| Mixzone | 4 | 26.29 | 6.5725 | 1.71929167 |
| Lake | 4 | 18.71 | 4.6775 | 0.17689167 |

ANOVA

Source of Variation

| | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
|---|---|---|---|---|---|---|
| Between Groups | 7.18205 | 1 | 7.18205 | 7.57526962 | 0.03318959 | 5.987374152 |
| Within Groups | 5.68855 | 6 | 0.94809167 | | | |
| Total | 12.8706 | 7 | | | | |

# Amoco Cove
## Shore Periphyton

| Evenness | |
|---|---|
| Mixzone | Lake |
| 1.21 | 1.2 |
| 1.48 | 1.26 |
| 1.31 | 1.12 |
| 1.19 | 1.27 |

**Shore Periphyton - Evenness**

Anova: Single-Factor

Summary

| *Groups* | *Count* | *Sum* | *Average* | *Variance* |
|---|---|---|---|---|
| Mixzone | 4 | 5.19 | 1.2975 | 0.01755833 |
| Lake | 4 | 4.85 | 1.2125 | 0.00475833 |

ANOVA

| Source of Variation | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
|---|---|---|---|---|---|---|
| Between Groups | 0.01445 | 1 | 0.01445 | 1.29499627 | 0.29852064 | 5.98737415 |
| Within Groups | 0.06695 | 6 | 0.01115833 | | | |
| Total | 0.0814 | 7 | | | | |

| Amoco Episammon | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
| Richness | | Shannon-Weiner | | Simpson's Diversity | | Hill's N1 | | | | |
| Mixzone | Lake | Mixzone | Lake | Mixzone | Lake | Mixzone | Lake | | | |
| 16 | 19 | 2.444 | 2.525 | 0.121 | 0.084 | 10.993 | 12.494 | | | |
| 17 | 13 | 2.397 | 2.228 | 0.108 | 0.1223 | 11.516 | 9.285 | | | |
| | | | | | | | | | | |
| t-Test: Two-Sample Assuming Equal Variances | | | | | | t-Test: Two-Sample | | | | |
| *Richness* | | | *Mixzone* | *Lake* | | *Shannon* | | | *Mixzone* | *Lake* |
| Mean | | | 16.5 | 16 | | Mean | | | 2.4205 | 2.3765 |
| Variance | | | 0.5 | 18 | | Variance | | | 0.001105 | 0.044104 |
| Observations | | | 2 | 2 | | Observations | | | 2 | 2 |
| Pooled Variance | | | 9.25 | | | Pooled Variance | | | 0.022605 | |
| Hypothesized Mean Difference | | | 0 | | | Hypothesized Mean Difference | | | 0 | |
| df | | | 2 | | | df | | | 2 | |
| t | | | 0.164399 | ns | | t | | | 0.292655 | ns |
| P(T<=t) one-tail | | | 0.442265 | | | P(T<=t) one-tail | | | 0.398678 | |
| t Critical one-tail | | | 2.919987 | | | t Critical one-tail | | | 2.919987 | |
| P(T<=t) two-tail | | | 0.88453 | | | P(T<=t) two-tail | | | 0.797355 | |
| t Critical two-tail | | | 4.302656 | | | t Critical two-tail | | | 4.302656 | |
| | | | | | | | | | | |
| t-Test: Two-Sample Assuming Equal Variances | | | | | | t-Test: Two-Sample | | | | |
| *Hill's N1* | | | *Mixzone* | *Lake* | | *Simpson's Diversity* | | | *Mixzone* | *Lake* |
| Mean | | | 11.2545 | 10.8895 | | Mean | | | 0.1145 | 0.10315 |
| Variance | | | 0.136765 | 5.148841 | | Variance | | | 8.45E-05 | 0.000733 |
| Observations | | | 2 | 2 | | Observations | | | 2 | 2 |
| Pooled Variance | | | 2.642803 | | | Pooled Variance | | | 0.000409 | |
| Hypothesized Mean Difference | | | 0 | | | Hypothesized Mean Difference | | | 0 | |
| df | | | 2 | | | df | | | 2 | |
| t | | | 0.224523 | ns | | t | | | 0.56124 | ns |
| P(T<=t) one-tail | | | 0.421601 | | | P(T<=t) one-tail | | | 0.315565 | |
| t Critical one-tail | | | 2.919987 | | | t Critical one-tail | | | 2.919987 | |
| P(T<=t) two-tail | | | 0.843202 | | | P(T<=t) two-tail | | | 0.631129 | |
| t Critical two-tail | | | 4.302656 | | | t Critical two-tail | | | 4.302656 | |

# BRAY-CURTIS